

WHAT IS CLAIMED IS:

1                   1.       An isolated nucleic acid encoding a CNG3B subunit of a cation  
2 channel, the polypeptide:

3                   (i) forming, with at least one additional alpha subunit, a cation  
4 channel having the characteristic of cyclic nucleotide-gating; and

5                   (ii) comprising a subsequence having at least 85% amino acid  
6 sequence identity to amino acids 210 to 661 of SEQ ID NO:1.

1                   2.       The nucleic acid of claim 1, wherein the polypeptide specifically  
2 binds to antibodies generated against a polypeptide comprising an amino acid sequence of  
3 SEQ ID NO:1.

1                   3.       The nucleic acid of claim 1, wherein the nucleic acid encodes a  
2 polypeptide comprising an amino acid sequence of SEQ ID NO:1.

1                   4.       The nucleic acid of claim 1, wherein the nucleic acid comprises a  
2 nucleotide sequence of SEQ ID NO:2 or SEQ ID NO:3.

1                   5.       The nucleic acid of claim 1, wherein the nucleic acid is amplified  
2 by primers that selectively hybridize under stringent hybridization conditions to the same  
3 sequence as the primers selected from the group consisting of:

4                   TCTATCTCCTGTGGCTCTTGCTTGTC (SEQ ID NO:4)

5                   GAGTCTGGGCTGGATAAATAGCATATC (SEQ ID NO:5)

6                   AGGAATTGGCACTACTAGATGGGTG (SEQ ID NO:6)

7                   TTCATGAGGATCCTTTTCAAGATCTGG (SEQ ID NO:7)

8                   GGAAACCGTCGAACTGCCAATGTGGT (SEQ ID NO:8)

9                   CGGGTTTGCCAATCTTTTAACTCTAGAC (SEQ ID NO:9)

10                  GTCCGCAATAAGCCAGTAGTGTATG (SEQ ID NO:10)

11                  TGACAAGCTTCCGCCATGTTTAAATCGCTGACAAAAGTC (SEQ

12 ID NO:11) and

13                  TGACGAATTCTCCCAGCATGTCGTTTCCCCTCGTTAA (SEQ ID

14 NO:12), wherein the amplification reaction comprises forty cycles comprising a

15 denaturation phase of 95°C for fifteen seconds, an annealing phase of 58°C for fifteen

16 seconds, and an extension phase of 72°C for 2.5 minutes.

1                   6.       The nucleic acid of claim 1, wherein the polypeptide comprises a  
2   beta subunit of a heteromeric cyclic nucleotide gated cation channel.

1                   7.       The nucleic acid of claim 1, wherein the nucleic acid specifically  
2   hybridizes under moderately stringent hybridization conditions to a nucleic acid  
3   comprising a nucleotide sequence of SEQ ID NO:2 or SEQ ID NO:3, wherein the  
4   hybridization reaction is incubated overnight at 37°C in a solution comprising 40%  
5   formamide, 1 M NaCl and 1% SDS, and washed at 45°C in a solution comprising 1x  
6   SSC.

1                   8.       An isolated nucleic acid encoding a CNG3B subunit of a cation  
2   channel, the nucleic acid specifically hybridizing under stringent conditions to a nucleic  
3   acid comprising a nucleotide sequence of SEQ ID NO:2 or SEQ ID NO:3, wherein the  
4   hybridization reaction is incubated overnight at 42°C in a solution comprising 50%  
5   formamide, 5x SSC and 1% SDS, and washed at 65°C in a solution comprising 0.2x SSC.

1                   9.       An isolated nucleic acid that specifically hybridizes under stringent  
2   conditions to a nucleic acid encoding an amino acid sequence of SEQ ID NO:1, wherein  
3   the hybridization reaction is incubated overnight at 42°C in a solution comprising 50%  
4   formamide, 5x SSC and 1% SDS, and washed at 65°C in a solution comprising 0.2x SSC.

1                   10.      A method of detecting a nucleic acid, the method comprising  
2   contacting the nucleic acid with an isolated nucleic acid of claim 1.

1                   11.      An isolated polypeptide comprising a CNG3B subunit of a cation  
2   channel, the polypeptide:

3                           (i) forming, with at least one additional alpha subunit, a cation  
4   channel having the characteristic of cyclic nucleotide-gating; and

5                           (ii) comprising a subsequence having at least 85% amino acid  
6   sequence identity to amino acids 210 to 661 of SEQ ID NO:1.

1                   12.      The polypeptide of claim 11, wherein the polypeptide specifically  
2   binds to antibodies generated against SEQ ID NO:1.

1                   13.      The polypeptide of claim 11, wherein the polypeptide has a  
2   molecular weight of between about 87 kD to about 97 kD.

1                    14.    The polypeptide of claim 11, wherein the polypeptide has an amino  
2 acid sequence of SEQ ID NO:1.

1                    15.    The polypeptide of claim 11, wherein the polypeptide comprises a  
2 beta subunit of a heteromeric cyclic nucleotide-gated cation channel.

1                    16.    An antibody that specifically binds to the CNG3B polypeptide of  
2 claim 11.

1                    17.    The antibody of claim 16, wherein the polypeptide to which the  
2 antibody binds has an amino acid sequence of SEQ ID NO:1.

1                    18.    An expression vector comprising the nucleic acid of claim 1.

1                    19.    A host cell transfected with the vector of claim 18.

1                    20.    A method for identifying a compound that increases or decreases  
2 ion flux through a cation channel, the method comprising the steps of:

3                    (i) contacting the compound with a CNG3B polypeptide subunit, the  
4 polypeptide

5                    (a) forming, with at least one additional alpha subunit, a cation  
6 channel having the characteristic of cyclic nucleotide-gating; and

7                    (b) comprising a subsequence having at least 85% amino acid  
8 sequence identity to amino acids 210 to 661 of SEQ ID NO:1; and

9                    (ii) determining the functional effect of the compound upon the cation  
10 channel.

1                    21.    The method of claim 20, wherein the functional effect is a physical  
2 effect.

1                    22.    The method of claim 20, wherein the functional effect is a chemical  
2 effect.

1                    23.    The method of claim 20, wherein the polypeptide is expressed in a  
2 eukaryotic host cell or cell membrane.

1                   24.     The method of claim 23, wherein the functional effect is  
2 determined by measuring ion flux, changes in ion concentrations, changes in current or  
3 changes in voltage.

1                   25.     The method of claim 20, wherein the functional effect is  
2 determined by measuring ligand binding to the channel.

1                   26.     The method of claim 20, wherein the polypeptide is recombinant.

1                   27.     The method of claim 20, wherein the cation channel is heteromeric.

1                   28.     The method of claim 20, wherein the polypeptide is human  
2 CNG3B.

1                   29.     The method of claim 20, wherein the polypeptide has an amino  
2 acid sequence of SEQ ID NO:1.

1                   30.     A method for identifying a compound that increases or decreases  
2 ion flux through a cyclic nucleotide-gated cation channel comprising a CNG3B  
3 polypeptide, the method comprising the steps of:

4                   (i) entering into a computer system an amino acid sequence of at least 35  
5 amino acids of a CNG3B polypeptide or at least 105 nucleotides of a nucleic acid  
6 encoding the CNG3B polypeptide, the CNG3B polypeptide comprising a subsequence  
7 having at least 85% amino acid sequence identity to amino acids 210 to 661 of SEQ ID  
8 NO:1;

9                   (ii) generating a three-dimensional structure of the polypeptide encoded  
10 by the amino acid sequence;

11                  (iii) generating a three-dimensional structure of the compound; and

12                  (iv) comparing the three-dimensional structures of the polypeptide and  
13 the compound to determine whether or not the compound binds to the polypeptide.

1                   31.     A method of modulating ion flux through a CNG cation channel  
2 comprising a CNG3B subunit to treat a disease in a subject, the method comprising the  
3 step of administering to the subject a therapeutically effective amount of a compound  
4 identified using the method of claim 20 or 30.

1                   32.     A method of detecting the presence of CNG3B in human tissue, the  
2 method comprising the steps of:

- 3                   (i) isolating a biological sample;  
4                   (ii) contacting the biological sample with a CNG3B-specific  
5 reagent that selectively associates with CNG3B; and,  
6                   (iii) detecting the level of CNG3B-specific reagent that selectively  
7 associates with the sample.

1                   33.     The method of claim 32, wherein the CNG3B-specific reagent is  
2 selected from the group consisting of: CNG3B-specific antibodies, CNG3B-specific  
3 oligonucleotide primers, and CNG3B-nucleic acid probes.

1                   34.     In a computer system, a method of screening for mutations of a  
2 human CNG3B gene, the method comprising the steps of:  
3                   (i) entering into the computer a first nucleic acid sequence  
4 encoding a CNG3B polypeptide having a nucleotide sequence of SEQ ID NO:2 or SEQ  
5 ID NO:3, and conservatively modified versions thereof;  
6                   (ii) comparing the first nucleic acid sequence with a second nucleic  
7 acid sequence having substantial identity to the first nucleic acid sequence; and  
8                   (iii) identifying nucleotide differences between the first and second  
9 nucleic acid sequences.

10                  35.     The method of claim 34, wherein the second nucleic acid sequence  
is associated with a disease state.